

10191/2234
JC10 Rec'd PCT/PTO 06 FEB 2002

FORM PTO-1390 (REV. 5-93)		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE		ATTORNEY'S DOCKET NUMBER 10191/2234	
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371				U.S. APPLICATION NO. (If known, see 37 CFR 1.5)	
				10/049363	
INTERNATIONAL APPLICATION NO. PCT/DE00/02149		INTERNATIONAL FILING DATE (01.07.00) 1 July 2000		PRIORITY DATE(S) CLAIMED (06.08.99) 06 August 1999	
TITLE OF INVENTION SNAP RING					
APPLICANT(S) FOR DO/EO/US Karl FRAUHAMMER; Manfred HELLBACH; Frank MUELLER; Heinz SCHNERRING; Joerg FRIEDRICH; and Andreas STRASSER					
Applicant(s) herewith submit to the United States Designated/Elected Office (DO/EO/US) the following items and other information					
1. <input checked="" type="checkbox"/> This is a FIRST submission of items concerning a filing under 35 U.S.C. 371 2. <input type="checkbox"/> This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371. 3. <input checked="" type="checkbox"/> This is an express request to begin national examination procedures (35 U.S.C. 371(f)) immediately rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1). 4. <input checked="" type="checkbox"/> A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date. 5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2)) a. <input type="checkbox"/> is transmitted herewith (required only if not transmitted by the International Bureau). b. <input checked="" type="checkbox"/> has been transmitted by the International Bureau. c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US) 6. <input checked="" type="checkbox"/> A translation of the International Application into English (35 U.S.C. 371(c)(2)). 7. <input checked="" type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)) a. <input type="checkbox"/> are transmitted herewith (required only if not transmitted by the International Bureau). b. <input type="checkbox"/> have been transmitted by the International Bureau. c. <input type="checkbox"/> have not been made, however, the time limit for making such amendments has NOT expired. d. <input checked="" type="checkbox"/> have not been made and will not be made 8. <input type="checkbox"/> A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)) 9. <input checked="" type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)) (unsigned). 10. <input checked="" type="checkbox"/> A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)). Items 11. to 16. below concern other document(s) or information included: 11. <input checked="" type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98. 12. <input type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included. 13. <input checked="" type="checkbox"/> A FIRST preliminary amendment. <input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment. 14. <input checked="" type="checkbox"/> A substitute specification and a marked up version thereof. 15. <input type="checkbox"/> A change of power of attorney and/or address letter. 16. <input checked="" type="checkbox"/> Other items or information: International Search Report; International Preliminary Examination Report; and Form PCT/RO/101. (English Translations)					

Express Mail No. EL244510855

U.S. APPLICATION NO. if known, see 37 C.F.R.1.5 <div style="font-size: 2em; font-weight: bold; margin-top: 10px;">10/049363</div>	INTERNATIONAL APPLICATION NO PCT/DE00/02149	ATTORNEY'S DOCKET NUMBER 10191/2234
--	--	--

17. ☒ The following fees are submitted:

Basic National Fee (37 CFR 1.492(a)(1)-(5)):

Search Report has been prepared by the EPO or JPO \$890.00

International preliminary examination fee paid to USPTO (37 CFR 1.482) \$740.00

No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)) \$710.00

Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$1,040.00

International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4) \$100.00

CALCULATIONS
PTO USE ONLY

ENTER APPROPRIATE BASIC FEE AMOUNT =				\$ 890	
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				\$	
Claims	Number Filed	Number Extra	Rate		
Total Claims	7 - 20 =	0	X \$18.00	\$ 0	
Independent Claims	2 - 3 =	0	X \$84.00	\$ 0	
Multiple dependent claim(s) (if applicable)			+ \$270.00	\$ 0	
TOTAL OF ABOVE CALCULATIONS =				\$ 890	
Reduction by 1/2 for filing by small entity, if applicable. Verified Small Entity statement must also be filed. (Note 37 CFR 1.9, 1.27, 1.28).				\$	
SUBTOTAL =				\$ 890	
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				+	\$
TOTAL NATIONAL FEE =				\$ 890	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property				+	\$
TOTAL FEES ENCLOSED =				\$ 890	
				Amount to be:	
				refunded	\$
				charged	\$

a. ☐ A check in the amount of \$ _____ to cover the above fees is enclosed.

b. ☒ Please charge my Deposit Account No. 11-0600 in the amount of **\$890.00** to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 11-0600. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

Kenyon & Kenyon
One Broadway
New York, New York 10004
CUSTOMER NO. 26646

By: [Signature]

 SIGNATURE

Richard L. Mayer, Reg. No. 22,490
NAME

2/6/02
DATE

FORM PTO-1390 (REV. 5-93)		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371		ATTORNEY'S DOCKET NUMBER 10191/2234	
		U.S. APPLICATION NO. (If known, see 37 CFR 1.5) <div style="font-size: 1.5em; font-weight: bold;">10/049363</div>	
INTERNATIONAL APPLICATION NO. PCT/DE00/02149	INTERNATIONAL FILING DATE (01 07 00) 1 July 2000	PRIORITY DATE(S) CLAIMED (06 08 99) 06 August 1999	
TITLE OF INVENTION SNAP RING			
APPLICANT(S) FOR DO/EO/US Karl FRAUHAMMER, Manfred HELLBACH, Frank MUELLER; Heinz SCHNERRING; Joerg FRIEDRICH, and Andreas STRASSER			
Applicant(s) herewith submit to the United States Designated/Elected Office (DO/EO/US) the following items and other information			
1. <input checked="" type="checkbox"/> This is a FIRST submission of items concerning a filing under 35 U.S.C. 371.			
2. <input type="checkbox"/> This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371.			
3. <input checked="" type="checkbox"/> This is an express request to begin national examination procedures (35 U.S.C. 371(f)) immediately rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).			
4. <input checked="" type="checkbox"/> A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.			
5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2))			
a. <input type="checkbox"/> is transmitted herewith (required only if not transmitted by the International Bureau)			
b. <input checked="" type="checkbox"/> has been transmitted by the International Bureau.			
c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US)			
6. <input checked="" type="checkbox"/> A translation of the International Application into English (35 U.S.C. 371(c)(2)).			
7. <input checked="" type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))			
a. <input type="checkbox"/> are transmitted herewith (required only if not transmitted by the International Bureau).			
b. <input type="checkbox"/> have been transmitted by the International Bureau			
c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired.			
d. <input checked="" type="checkbox"/> have not been made and will not be made.			
8. <input type="checkbox"/> A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).			
9. <input checked="" type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)) (unsigned).			
10. <input checked="" type="checkbox"/> A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).			
Items 11. to 16. below concern other document(s) or information included:			
11. <input checked="" type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98.			
12. <input type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.			
13. <input checked="" type="checkbox"/> A FIRST preliminary amendment.			
<input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment.			
14. <input checked="" type="checkbox"/> A substitute specification and a marked up version thereof.			
15. <input type="checkbox"/> A change of power of attorney and/or address letter.			
16. <input checked="" type="checkbox"/> Other items or information: International Search Report; International Preliminary Examination Report; and Form PCT/RO/101. (English Translations)			

10/049363

JC13 Rec'd PCT/PTO 06 FEB 2002

[10191/2234]

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

#4
a

Applicant(s) : Karl FRAUHAMMER et al.
Serial No. : To Be Assigned
Filed : Herewith
For : SNAP RING
Art Unit : To Be Assigned
Examiner : To Be Assigned

Assistant Commissioner
for Patents
Washington, D.C. 20231

**PRELIMINARY AMENDMENT AND
37 C.F.R. § 1.125 SUBSTITUTE SPECIFICATION STATEMENT**

SIR:

Please amend without prejudice the above-identified application before examination, as set forth below.

IN THE SPECIFICATION AND ABSTRACT:

In accordance with 37 C.F.R. § 1.121(b)(3), a Substitute Specification (including the Abstract, but without claims) accompanies this response. It is respectfully requested that the Substitute Specification (including Abstract) be entered to replace the Specification of record.

IN THE CLAIMS:

Without prejudice, please cancel original claims 1 to 9. Please also cancel claim 1 in the annex to the International Preliminary Examination Report, and add new claims 10 to 16 as follows:

10. (New) A snap ring for shafts or bores fixable in axial position by snapping into a circumferential groove, the snap ring comprising:

EL244510855

a substantially annular clip having two limbs, each limb having an end section;
a centering member radially separated from the clip; and
at least one web joining the centering member to the clip, the at least one web being situated near the end section of one of the two limbs of the clip.

11. (New) The snap ring of claim 10, wherein the centering member is configured as a centering ring having a center bore, the centering ring being positioned approximately concentrically with respect to the circumferential groove when the snap ring is installed in the circumferential groove.

12. (New) The snap ring of claim 10, wherein the clip encircles the centering member, and the snap ring is configured as an internal ring for a radially inwardly open circumferential groove.

13. (New) The snap ring of claim 10, wherein the end sections of the limbs of the clip are formed as lugs.

14. (New) The snap ring of claim 13, wherein the lugs have flat surfaces mutually opposing one another, the flat surfaces being used as mutual stop faces.

15. (New) The snap ring of claim 14, wherein the flat surfaces of the lugs are aligned radially with respect to a midpoint of the snap ring.

16. (New) A method of axially fixing a sealing ring in position, the sealing ring including at least one sealing lip which is provided for making contact on a shaft, the method comprising:

snapping a snap ring into a circumferential groove, the snap ring including:

a substantially annular clip having two limbs, each limb having an end section;
a centering member radially separated from the clip; and
at least one web joining the centering member to the clip, the at least one web being situated near the end of one of the two limbs of the clip; and
positioning the sealing ring in a position axially adjacent to the snap ring.

[illegible]

In accordance with 37 C.F.R. § 1.121(b)(3), the Substitute Specification (including the Abstract, but without the claims) contains no new matter. The amendments reflected in the Substitute Specification (including Abstract) are to conform the Specification and Abstract to U.S. Patent and Trademark Office rules, to correct informalities and to include Substitute Pages in the annex of the International Preliminary Examination Report. As required by 37 C.F.R. § 1.121(b)(3)(iii) and § 1.125(b)(2), a Marked Up Version Of The Substitute Specification comparing the Specification of record and the Substitute Specification also accompanies this Preliminary Amendment. Approval and entry of the Substitute Specification (including Abstract) is respectfully requested.

The underlying PCT application also includes an International Preliminary Examination Report, dated October 4, 2001, and an annex. An English translation of the International Preliminary Examination Report and the annex accompanies this Preliminary Amendment.

Applicants assert that the subject matter of the present application is new, non-obvious, and useful. Prompt consideration and allowance of the application are respectfully requested.

Dated: 2/6/02

Respectfully Submitted,

KENYON & KENYON

By: *Richard L. Mayer*

Richard L. Mayer

(Reg. No. 22,490)

One Broadway
New York, NY 10004
(212) 425-7200

2/pzt

[10191/2234]

SNAP RING

Field Of The Invention

The present invention is directed to a snap ring.

Background Information

5 Snap retaining rings are already known which are used for axially securing structural components, such as bearings, gears, or sealing rings to shafts or bores. Snap rings of this kind can be designed to engage with radially inwardly open circumferential grooves, in bores, or with radially outwardly open circumferential grooves, in shafts. These snap rings exist in various removable and non-removable designs. They also constitute the subject matter of various standards (e.g., DIN, ISO). The snap rings are normally grooved with undersized and/or oversized dimensions, so that, once inserted into a corresponding circumferential groove, they are held by self-action in the shaft or bore, under prestressing. For example, International Patent Application WO 79/12170 discloses a snap ring which is provided with a centering member that extends with radial clearance to a circumferentially disposed annular clip of the snap ring which forms two limbs.

Summary Of The Invention

25 The advantage of the snap ring according to the present invention is that, in addition to the axial retaining function, it also enables a centering action to be performed between a bore and a shaft or spindle to be inserted therein during assembly. In this manner, one can prevent a shaft sealing ring located between a bore and a shaft from becoming damaged, for example, by sharp edges or offsets during assembly due to the shaft and bore becoming skewed. Thus, one avoids a premature failure of the sealing action of the shaft

SUBSTITUTE SPECIFICATION

EL244510855

sealing ring.

Due to the fact that the radial cross-sections of the two limbs of the snap ring taper off towards their unattached ends, the snap ring is uniformly deformed in response to its two limbs being compressed upon installation.

Brief Description of the Drawings

Figure 1 shows a plan view of a snap ring according to the present invention, having a centering function in accordance with a first exemplary embodiment.

Figure 2 illustrates a plan view of a snap ring according to the present invention, having a centering function in accordance with a second exemplary embodiment.

Figure 3 is a part-sectional view through a hammer drill, which has a snap ring according to the present invention, having a centering function.

Detailed Description

In Figure 1, 10 denotes a snap ring which has a concentrically disposed, or approximately annular, slotted clip 11 of resilient material, in particular of spring steel. At its two free ends, clip 11 has lugs 12, 13, through each of which perforations 14, 15 are cut. As is generally known, into perforations 14, 15, one may insert snap ring pliers, which, by changing the distance between lugs 12, 13, make it possible to vary the diameter of clip 11 in order to install snap ring 10.

In Figure 1, snap ring 10 is designed as an internal ring for a radially inwardly open circumferential groove and is, therefore, suited for axially securing a component to a bore. Located inside clip 11 is a centering ring 17, which is joined

to clip 11 by way of a web 16. Centering ring 17 is provided with a center bore 18, which is disposed approximately concentrically with respect to snap ring 10 and to a corresponding circumferential groove into which snap ring 10 is insertable. On the side of clip 11 facing opposite web 16, a notch 19 is provided, which divides clip 11 into two limbs 11a, b. Limbs 11a, b are formed with a radial cross-section that tapers off toward the unattached ends, resulting in a uniform deformation when snap ring 10 is installed. Located at each of the mutually opposing surfaces of lugs 12, 13 are flat portions 12a, 13a, which are used as mutual stop faces. In this context, flat portions 12a, 13a are aligned in parallel to radial traces 36, 37, respectively, which run through a midpoint 35 of snap ring 10. The stop faces ensure that the material stress that clip 11 is subject to during installation of snap ring 10 is kept within acceptable limits.

Figure 2 illustrates a second exemplary embodiment of a snap ring 10 having a centering function. Equivalent parts and parts performing equivalent functions are denoted by the same reference numerals. In comparison to the exemplary embodiment according to Figure 1, the second exemplary embodiment according to Figure 2 is distinguished by web 16 being located in the vicinity of a lug 12. In this context, centering ring 17 is likewise encircled by clip 11, so that snap ring 10 shown in Figure 2 is likewise designed as an internal ring.

Figure 3 depicts an application case for a snap ring 10 according to the present invention. Here, Figure 3 shows a partial section through a driving device 21 of a hammer drill. In the left half of the illustration of Figure 3, the driving device is shown in a final assembled position, while in the right half, it is shown during assembly.

An electromotor 22 has a motor shaft 23, which is provided on

the inside with an armature pinion 24. In this context, motor shaft 23 is rotationally mounted via an antifriction roller bearing 25 at a gear housing 26. Seated next to and in front of antifriction bearing 25 in a through-hole 27 in gear housing 26 is a sealing ring 28, which, by way of its sealing lip 29, seals off a gear compartment 30 from a motor compartment 31. For that purpose, sealing lip 29 engages on the outer surface of motor shaft 23 (left half of the illustration in Figure 3). Within through-hole 27, sealing ring 28 is axially secured by snap ring 10. In this context, snap ring 10 is seated, under prestressing, in a concentrically disposed, internal groove 32 in gear housing 26.

In the right half of Figure 3, driving device 21 is shown in its assembled position. Here, antifriction bearing 25 is pressed onto motor shaft 23 and is installed, together with motor shaft 23 and electromotor 22, in through-hole 27. In so doing, armature pinion 24 initially reaches through centering bore 18 in centering ring 17, and is radially guided by the same. In response to further insertion of driving device 21, armature pinion then reaches through the sealing opening formed by sealing lips 29, deeper into bore 27, until it subsequently engages fully with gears 33, 34 in gear compartment 30, as shown in the left half of the illustration. Centering ring 17, which, together with snap ring 10, forms one unit, prevents the sealing lip from being damaged by armature pinion 24, which may be sharp-edged, during insertion of driving device 21. To this end, centering bore 18 is designed to be approximately concentric with circumferential groove 32.

The present invention is not limited to the described exemplary embodiments. Thus, when working with a snap ring designed as an external ring for shafts, it is also possible

for the centering ring to wrap around the outside of the clip.
In place of one web, a plurality of webs may also be provided
for joining the centering ring and clip.

Abstract Of The Disclosure

A snap ring for shafts or bores is proposed, which is able to be axially fixed in position by snapping into place in a circumferential groove. The snap ring is provided with a centering ring which, when the case of the snap ring is installed in the circumferential groove, extends with radial clearance to an annular clip of the snap ring, which is disposed approximately concentrically to the circumferential groove.

SNAP RING

Field Of The Invention

The present invention is directed to a snap ring.

Background Information

5 [The present invention is directed to a snap ring according to the definition of the species in Claim 1.] Snap retaining rings are already known which are used for axially securing structural components, such as bearings, gears, or sealing rings to shafts or bores. Snap rings of this kind can be
10 designed to engage with radially inwardly open circumferential grooves, in bores, or with radially outwardly open circumferential grooves, in shafts. These snap rings exist in various removable and non-removable designs. They also constitute the subject matter of various standards (e.g., DIN,
15 ISO). The snap rings are normally grooved with undersized and/or oversized dimensions, so that, once inserted into a corresponding circumferential groove, they are held by self-action in the shaft or bore, under prestressing. For example, International Patent Application WO 79/12170
20 discloses a snap ring which is provided with a centering member that extends with radial clearance to a circumferentially disposed annular clip of the snap ring which forms two limbs.

25 Summary Of The [Summary of the] Invention

The advantage of the snap ring according to the present invention [having the features of Claim 1] is that, in addition to the axial retaining function, it also enables a centering action to be performed between a bore and a shaft or
30 spindle to be inserted therein during assembly. In this manner, one can prevent a shaft sealing ring located between a bore and a shaft from becoming damaged, for example, by sharp

edges or offsets during assembly due to the shaft and bore becoming skewed. Thus, one avoids a premature failure of the sealing action of the shaft sealing ring.

5 [Advantageous further embodiments of the snap ring according to the present invention and improvements thereto are rendered possible by the measures delineated in the dependent claims.]
10 Due to the fact that the radial cross-sections of the two limbs of the snap ring taper off towards their unattached ends, the snap ring is uniformly deformed in response to its two limbs being compressed upon installation.

Brief Description of the Drawings [Drawing

15 Two exemplary embodiments of the present invention are depicted in the drawing and are elucidated in the following description.]

Figure 1 shows a plan view of a snap ring according to the present invention, having a centering function in accordance with a first exemplary embodiment[;].

Figure 2 illustrates a plan view of a snap ring according to the present invention, having a centering function in accordance with a second exemplary embodiment[; and].

Figure 3 is a part-sectional view through a hammer drill, which has a snap ring according to the present invention, having a centering function.

Detailed Description

In Figure 1, 10 denotes a snap ring which has a concentrically disposed, or approximately annular, slotted clip 11 of resilient material, in particular of spring steel. At its two free ends, clip 11 has lugs 12, 13, through each of which perforations 14, 15 are cut. As is generally known, into

perforations 14, 15, one may insert snap ring pliers, which, by changing the distance between lugs 12, 13, make it possible to vary the diameter of clip 11 in order to install snap ring 10.

5

In Figure 1, snap ring 10 is designed as an internal ring for a radially inwardly open circumferential groove and is, therefore, suited for axially securing a component to a bore. Located inside clip 11 is a centering ring 17, which is joined to clip 11 by way of a web 16. Centering ring 17 is provided with a center bore 18, which is disposed approximately concentrically with respect to snap ring 10 and to a corresponding circumferential groove into which snap ring 10 is insertable. On the side of clip 11 facing opposite web 16, a notch 19 is provided, which divides clip 11 into two limbs 11a, b. Limbs 11a, b are formed with a radial cross-section that tapers off toward the unattached ends, resulting in a uniform deformation when snap ring 10 is installed. Located at each of the mutually opposing surfaces of lugs 12, 13 are flat portions 12a, 13a, which are used as mutual stop faces. In this context, flat portions 12a, 13a are aligned in parallel to radial traces 36, 37, respectively, which run through a midpoint 35 of snap ring 10. The stop faces ensure that the material stress that clip 11 is subject to during installation of snap ring 10 is kept within acceptable limits.

Figure 2 illustrates a second exemplary embodiment of a snap ring 10 having a centering function. Equivalent parts and parts performing equivalent functions are denoted by the same reference numerals. In comparison to the exemplary embodiment according to Figure 1, the second exemplary embodiment according to Figure 2 is distinguished by web 16 being located in the vicinity of a lug 12. In this context, centering ring 17 is likewise encircled by clip 11, so that snap ring 10 shown in Figure 2 is likewise designed as an internal ring.

Figure 3 depicts an application case for a snap ring 10 according to the present invention. Here, Figure 3 shows a partial section through a driving device 21 of a hammer drill. In the left half of the illustration of Figure 3, the driving device is shown in a final assembled position, while in the right half, it is shown during assembly.

An electromotor 22 has a motor shaft 23, which is provided on the inside with an armature pinion 24. In this context, motor shaft 23 is rotationally mounted via an antifriction roller bearing 25 at a gear housing 26. Seated next to and in front of antifriction bearing 25 in a through-hole 27 in gear housing 26 is a sealing ring 28, which, by way of its sealing lip 29, seals off a gear compartment 30 from a motor compartment 31. For that purpose, sealing lip 29 engages on the outer surface of motor shaft 23 (left half of the illustration in Figure 3). Within through-hole 27, sealing ring 28 is axially secured by snap ring 10. In this context, snap ring 10 is seated, under prestressing, in a concentrically disposed, internal groove 32 in gear housing 26.

In the right half of Figure 3, driving device 21 is shown in its assembled position. Here, antifriction bearing 25 is pressed onto motor shaft 23 and is installed, together with motor shaft 23 and electromotor 22, in through-hole 27. In so doing, armature pinion 24 initially reaches through centering bore 18 in centering ring 17, and is radially guided by the same. In response to further insertion of driving device 21, armature pinion then reaches through the sealing opening formed by sealing lips 29, deeper into bore 27, until it subsequently engages fully with gears 33, 34 in gear compartment 30, as shown in the left half of the illustration. Centering ring 17, which, together with snap ring 10, forms one unit, prevents the sealing lip from being damaged by

armature pinion 24, which may be sharp-edged, during insertion of driving device 21. To this end, centering bore 18 is designed to be approximately concentric [to] with circumferential groove 32.

5

The present invention is not limited to the described exemplary embodiments. Thus, when working with a snap ring designed as an external ring for shafts, it is also possible for the centering ring to wrap around the outside of the clip.

10

In place of one web, a plurality of webs may also be provided for joining the centering ring and clip.

Abstract Of The Disclosure

A snap ring for shafts or bores is proposed, which is able to be axially fixed in position by snapping [it] into place in a circumferential groove[(32), the]. The snap ring [(10) being] is provided with a centering ring [(17)] which, [in] when the case of the snap ring [(10) being] is installed in the circumferential groove[(32)], extends with radial clearance to an annular clip [(11)] of the snap ring[(10)], which is
10 disposed approximately concentrically to the circumferential groove[(32)].

(Fig. 1)

446835

[10191/2234]

SNAP RING

Background Information

The present invention is directed to a snap ring according to the definition of the species in Claim 1. Snap retaining rings are already known which are used for axially securing structural components, such as bearings, gears, or sealing rings to shafts or bores. Snap rings of this kind can be designed to engage with radially inwardly open circumferential grooves, in bores, or with radially outwardly open circumferential grooves, in shafts. These snap rings exist in various removable and non-removable designs. They also constitute the subject matter of various standards (e.g., DIN, ISO). The snap rings are normally grooved with undersized and/or oversized dimensions, so that, once inserted into a corresponding circumferential groove, they are held by self-action in the shaft or bore, under prestressing.

Summary of the Invention

The advantage of the snap ring according to the present invention having the features of Claim 1 is that, in addition to the axial retaining function, it also enables a centering action to be performed between a bore and a shaft or spindle to be inserted therein during assembly. In this manner, one can prevent a shaft sealing ring located between a bore and a shaft from becoming damaged, for example, by sharp edges or offsets during assembly due to the shaft and bore becoming skewed. Thus, one avoids a premature failure of the sealing action of the shaft sealing ring.

Advantageous further embodiments of the snap ring according to the present invention and improvements thereto are rendered possible by the measures delineated in the dependent claims.

Brief Description of the Drawing

Two exemplary embodiments of the present invention are depicted in the drawing and are elucidated in the following description. Figure 1 shows a plan view of a snap ring according to the present invention, having a centering function in accordance with a first exemplary embodiment; Figure 2 illustrates a plan view of a snap ring according to the present invention, having a centering function in accordance with a second exemplary embodiment; and Figure 3 is a part-sectional view through a hammer drill, which has a snap ring according to the present invention, having a centering function.

Detailed Description

In Figure 1, 10 denotes a snap ring which has a concentrically disposed, slotted clip 11 of resilient material, in particular of spring steel. At its two free ends, clip 11 has lugs 12, 13, through each of which perforations 14, 15 are cut. As is generally known, into perforations 14, 15, one may insert snap ring pliers, which, by changing the distance between lugs 12, 13, make it possible to vary the diameter of clip 11 in order to install snap ring 10.

In Figure 1, snap ring 10 is designed as an internal ring for a radially inwardly open circumferential groove and is, therefore, suited for axially securing a component to a bore. Located inside clip 11 is a centering ring 17, which is joined to clip 11 by way of a web 16. Centering ring 17 is provided with a center bore 18, which is disposed approximately concentrically to snap ring 10 and to a corresponding circumferential groove into which snap ring 10 is insertable. On the side of clip 11 facing opposite web 16, a notch 19 is provided, which divides clip 11 into two limbs 11a, b. Limbs 11a, b are formed with a radial cross-section that tapers off toward the unattached ends, resulting in a uniform deformation

when snap ring 10 is installed. Located at each of the mutually opposing surfaces of lugs 12, 13 are flat portions 12a, 13a, which are used as mutual stop faces. In this context, flat portions 12a, 13a are aligned in parallel to radial traces 36, 37, respectively, which run through a midpoint 35 of snap ring 10. The stop faces ensure that the material stress that clip 11 is subject to during installation of snap ring 10 is kept within acceptable limits.

Figure 2 illustrates a second exemplary embodiment of a snap ring 10 having a centering function. Equivalent parts and parts performing equivalent functions are denoted by the same reference numerals. In comparison to the exemplary embodiment according to Figure 1, the second exemplary embodiment according to Figure 2 is distinguished by web 16 being located in the vicinity of a lug 12. In this context, centering ring 17 is likewise encircled by clip 11, so that snap ring 10 shown in Figure 2 is likewise designed as an internal ring.

Figure 3 depicts an application case for a snap ring 10 according to the present invention. Here, Figure 3 shows a partial section through a driving device 21 of a hammer drill. In the left half of the illustration of Figure 3, the driving device is shown in a final assembled position, while in the right half, it is shown during assembly.

An electromotor 22 has a motor shaft 23, which is provided on the inside with an armature pinion 24. In this context, motor shaft 23 is rotationally mounted via an antifriction roller bearing 25 at a gear housing 26. Seated next to and in front of antifriction bearing 25 in a through-hole 27 in gear housing 26 is a sealing ring 28, which, by way of its sealing lip 29, seals off a gear compartment 30 from a motor compartment 31. For that purpose, sealing lip 29 engages on the outer surface of motor shaft 23 (left half of the illustration in Figure 3). Within through-hole 27, sealing ring 28 is axially secured by snap ring 10. In this context,

snap ring 10 is seated, under prestressing, in a concentrically disposed, internal groove 32 in gear housing 26.

5 In the right half of Figure 3, driving device 21 is shown in its assembled position. Here, antifriction bearing 25 is pressed onto motor shaft 23 and is installed, together with motor shaft 23 and electromotor 22, in through-hole 27. In so doing, armature pinion 24 initially reaches through centering
10 bore 18 in centering ring 17, and is radially guided by the same. In response to further insertion of driving device 21, armature pinion then reaches through the sealing opening formed by sealing lips 29, deeper into bore 27, until it subsequently engages fully with gears 33, 34 in gear
15 compartment 30, as shown in the left half of the illustration. Centering ring 17, which, together with snap ring 10, forms one unit, prevents the sealing lip from being damaged by armature pinion 24, which may be sharp-edged, during insertion of driving device 21. To this end, centering bore 18 is
20 designed to be approximately concentric to circumferential groove 32.

The present invention is not limited to the described exemplary embodiments. Thus, when working with a snap ring
25 designed as an external ring for shafts, it is also possible for the centering ring to wrap around the outside of the clip. In place of one web, a plurality of webs may also be provided for joining the centering ring and clip.

What is claimed is:

1. A snap ring for shafts or bores, which is able to be axially fixed in position by snapping it into place in a circumferential groove (32), wherein the snap ring (10) is provided with a centering member (17), which extends with radial clearance to an approximately concentrically disposed clip (11) of the snap ring (10).
2. The snap ring as recited in Claim 1, wherein the centering member (17) is designed as a centering ring having a center bore (18), which, in the case of the snap ring (10) being installed in the circumferential groove (32), is positioned approximately concentrically to the circumferential groove (32).
3. The snap ring as recited in Claim 2, wherein the centering ring (17) is joined via at least one web (16) to the clip (11) of the snap ring (10).
4. The snap ring as recited in Claim 3, wherein the snap ring (10) is designed as an internal ring for a radially inwardly open circumferential groove (32), the clip (11) encircling the centering ring (17).
5. The snap ring as recited in Claim 3, wherein the at least one web (16) is situated on the clip (11) in the region between two lugs (12, 13) located at the extremities.
6. The snap ring as recited in Claim 5, wherein located at each of the mutually opposing surfaces of the lugs (12, 13) are flat portions (12a, 13a), which are used as mutual stop faces.

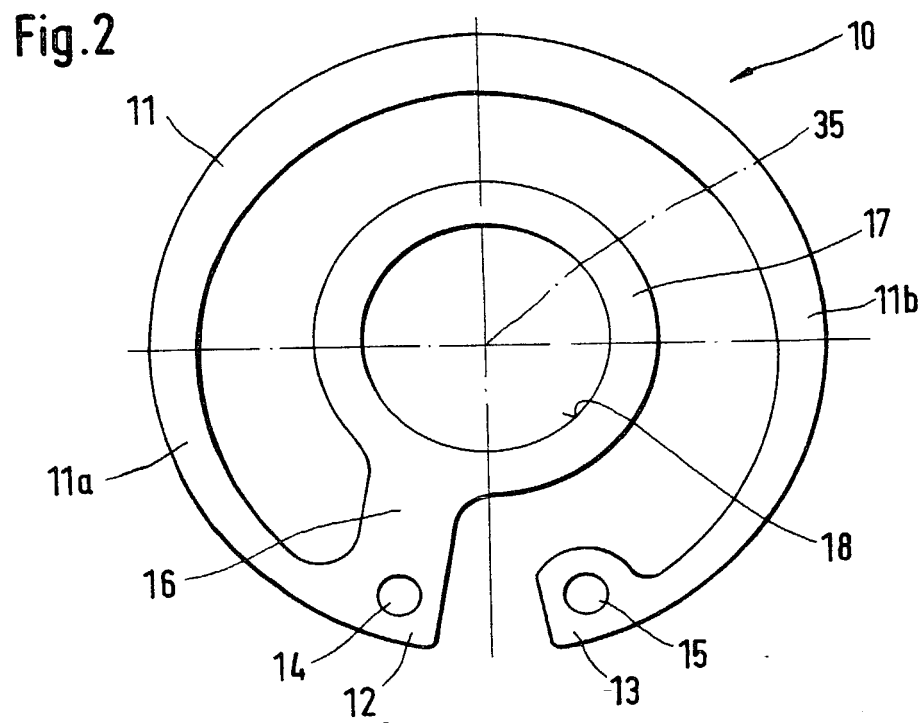
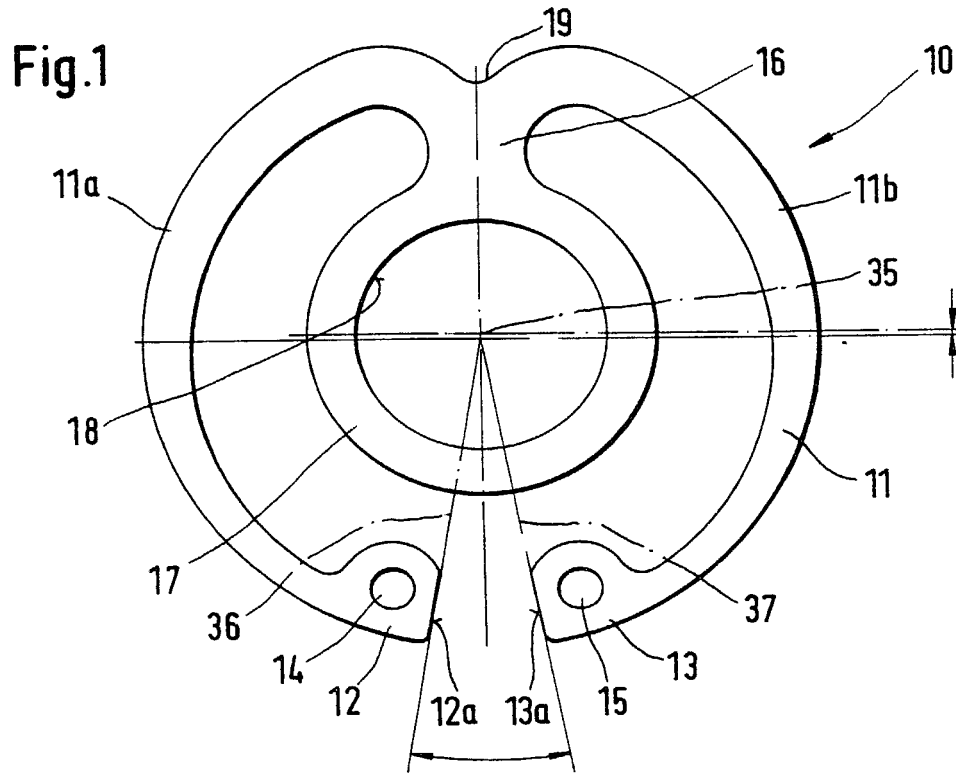
7. The snap ring as recited in Claim 6,
wherein the flat portions (12a, 13a) are aligned in
parallel to radial traces (36, 37), respectively, which
run through a midpoint (35) of the snap ring (10).
8. The snap ring as recited in Claim 3,
wherein the at least one web (16) is situated in the
region of a lug (12, 13) located at the extremity of the
snap ring.
9. The snap ring as recited in one of the preceding claims,
wherein the snap ring (10) is used for axially fixing a
sealing ring (28) in position, the sealing ring (28)
having at least one sealing lip (29), which is provided
for making contact on a shaft (23).

Abstract

A snap ring for shafts or bores is proposed, which is able to be axially fixed in position by snapping it into place in a circumferential groove (32), the snap ring (10) being provided with a centering ring (17) which, in the case of the snap ring (10) being installed in the circumferential groove (32), extends with radial clearance to an annular clip (11) of the snap ring (10), which is disposed approximately concentrically to the circumferential groove (32).

(Fig. 1)

1/2



2/2

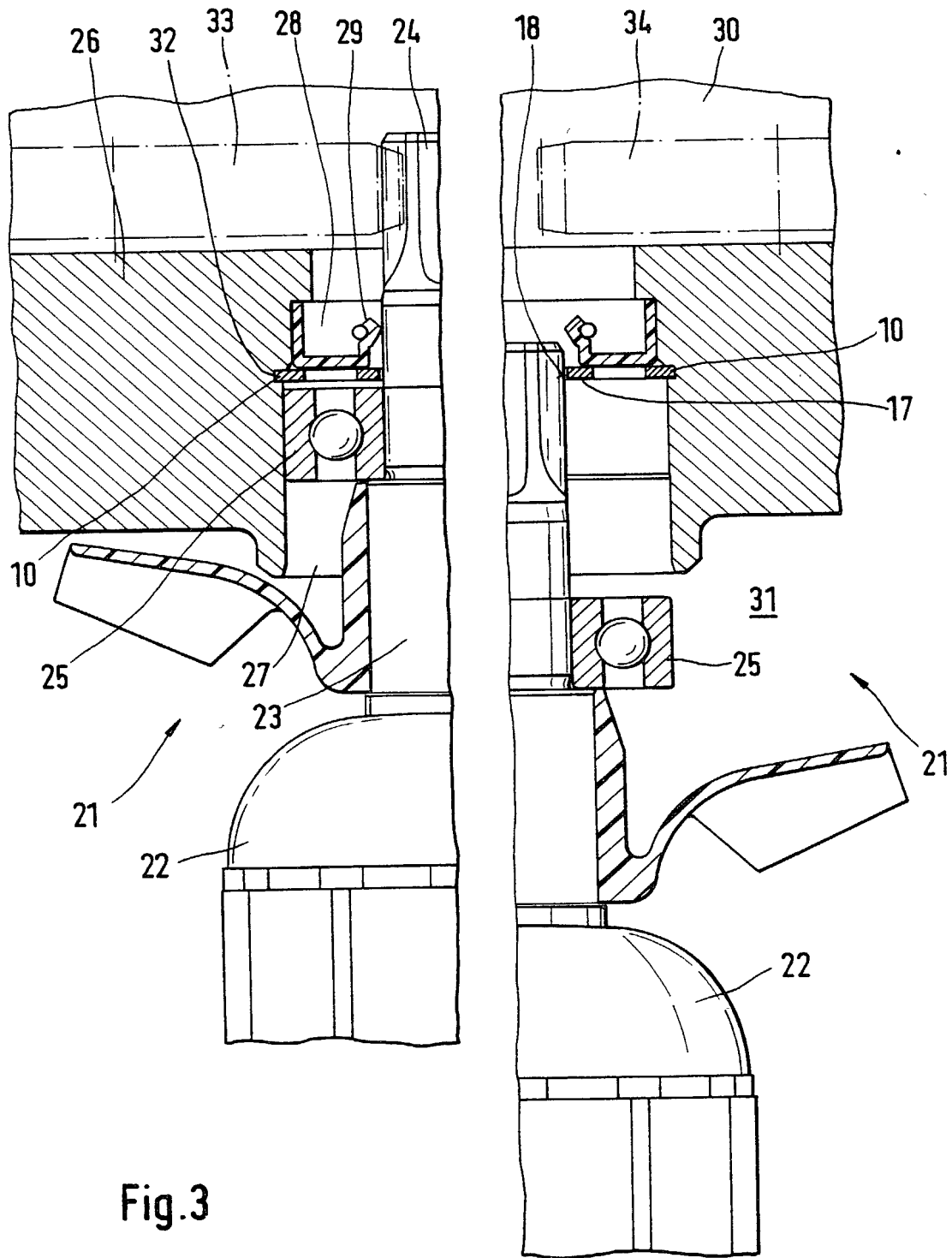


Fig.3

DECLARATION AND POWER OF ATTORNEY

~~EL 244510855~~
FL 244511635 u2

PRIOR FOREIGN APPLICATION(S)

Number	Country filed	Day/month/year	Priority Claimed Under 35 USC 119
✓ 199 36 708.6	Fed. Rep. of Germany	6 August 1999	Yes

And I hereby appoint Richard L. Mayer (Reg. No. 22,490) and Gerard A. Messina (Reg. No. 35,952) my attorneys with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith.

Please address all communications regarding this application to:

KENYON & KENYON
One Broadway
New York, New York 10004
CUSTOMER NO. 26646

Please direct all telephone calls to Richard L. Mayer at (212) 425-7200.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful and false statements may jeopardize the validity of the application or any patent issued thereon.

1-00 Inventor: Karl FRAUHAMMER

Inventor's Signature: Karl Frauhammer

Date: 22 02 02

Residence: Klingenstr. 24
70771 Leinfelden-Echterdingen
Federal Republic of Germany

DEX

Citizenship: Federal Republic of Germany

Post Office Address: Same as above.

200 Inventor: Manfred HELLBACH

Inventor's Signature: Manfred Hellbach

Date: 21.02.02

Residence: Lindenweg 11
70771 Leinfelden-Echterdingen
Federal Republic of Germany

DEX

Citizenship: Federal Republic of Germany

Post Office Address: Same as above.

300 Inventor: Frank MUELLER

Inventor's Signature: Frank Mueller

Date: 21.02.02

Residence: Drosselweg 6
75392 Deckenpfronn
Federal Republic of Germany *DEX*

Citizenship: Federal Republic of Germany

Post Office Address: Same as above.

400 Inventor: Heinz SCHNERRING

Inventor's Signature: Heinz Schnerring

Date: 21. Feb. 62

Residence: Lindenstr. 20
72135 Dettenhausen *DEX*
Federal Republic of Germany

Citizenship: Federal Republic of Germany

Post Office Address: Same as above.

500 Inventor: Joerg FRIEDRICH

Inventor's Signature: J. Friedrich

Date: 22/02/02

Residence: Bussardweg 11
70771 Leinfelden-Echterdingen
Federal Republic of Germany

DEX

Citizenship: Federal Republic of Germany

Post Office Address: Same as above.

6-00 Inventor: Andreas STRASSER

Inventor's Signature: Andreas Strasser

Date: 21.02.2002

Residence: Hegelstr. 6
73635 Rudersberg DEK
Federal Republic of Germany

Citizenship: Federal Republic of Germany

Post Office Address: Same as above.

445384